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Full Length Research

Effects of Anthropogenic Activities on the Diversity and Distribution of Bird Species in Ekiti State University, Ado Ekiti, Ekiti State, Nigeria

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An attempt was made to study the effects of anthropogenic activities on the diversity and distribution of bird species in three locations of Ekiti State University from May to July 2018. The study area was stratified based on levels of disturbance in the area and point counts techniques were employed for data collection. The study recorded 144 individual birds, belonging to 13 orders, 23 families and 43 species. A total of 20, 20 and 21 bird species were identified and their abundance was observed to be 47, 40 and 57 at locations L1, L2 and L3 respectively. The order Passeriformes constituted the dominant group with 28 families and 12 species. Analysis of bird species in the studied locations indicated that the birds in the sampled area were not homogenous in their distribution. The relative abundance of birds observed shows that 7, 4 and 7 species were found to be rare, 6, 7 and 8 species were uncommon, 7, 9 and 6 were frequent and none of the bird species were in abundant category. The result of Shannon- Weiner diversity index (H') considered revealed that L1 with index value 2.87 had the least species diversity, followed by L2 with value 2.89 while L3 had the highest diversity value of 2.93. The species richness revealed the highest value of 5.12 in the location of farming activities (L2) while the least species richness value of 4.47 was obtained in the pristine location of the university. The findings from the study provide evidence that anthropogenic activities area to an extent can serve as a refuge for birds provided the biological factors are within a safe threshold. Therefore, conservation efforts should as well be directed towards making communities view human occupied areas as a habitat for birds and not as a lost habitat.

Keywords: Anthropogenic, Conservation, Distribution and Diversity.

INTRODUCTION

One of the qualities of biodiversity is that it is not evenly distributed in an ecosystem. Each species has its own unique home range containing all the requirements needed for survival, which is determined by the interaction between existing ecological conditions and the species evolutionary history (Elmqvist et al., 2003). The biological distribution of biodiversity in nature is influenced majorly by both biotic and abiotic factors of the environment, as well as seasonality degree of variation in topography and prevailing climatic conditions. Besides, ecological determinants, anthropogenic activities that alter natural vegetation structure also play a dominant role in determining the pattern of the distribution and diversity of avian species (Strattersfield et al., 1998). Rapid increase in human population growth coupled with high demand for settlements, agricultural land and wood products are changing the structure of wildlife habitats, birds' diversity, patterns and the entire biodiversity in the biosphere (Gatesire et al., 2014). In Ekiti State University, the vegetation structure has been unprecedentedly altered and unfortunately the impacts of these changes on bird species compositions structure and diversity are yet to be fully understood. The inability to understand the consequence of changes in the natural habitats especially in the university community will invariably affects bird fauna that are quite sensitive to changes in the environmental conditions. The relevance of vegetation type is revealed in the adaption of biological life to temperature, rainfall, soil and other environmental factors (Maclean, 1990). Also, Davidar et al*.,* (2001) asserted that vegetation type is the most important factor determining bird species distribution. The physical structure of vegetation is considered an important vegetation component for birds both directly through the provision of food, shelter and nesting resources and indirectly, in providing potential cue about the onset of conditions suitable for successful breeding (Ralph, 2006). As the structural complexity of vegetation increases in terrestrial ecosystems, the number of many animal groups including birds increase (Tew, 2003). However, the manner and magnitude of the effect of disturbance on birds is determined by vegetation type (Murison et al., 2007). In view of the roles played vegetation in the existence avian, the vegetation-specific effect of anthropogenic activities on birds is worthy of investigation in Ekiti State University in order to provide information that will enhance birds' management.

METHODOLOGY

Description of the Study Area

The study was carried out in Ekiti State University campus, located on latitude 7.7141 N and longitude 5.2601 E. Ekiti State University has a total land mass of 2,096ha. The climatic condition is mainly tropical with the two distinct seasons in the year, the wet season (April-November) and a dry season stretching from November to the end of March. The recorded mean annual rainfall ranges from 1,500mm to 2,000mm falling on an average of 270days per year. The mean minimum temperature is between 21^{0}C, while the mean maximum temperature is 30^{0}C (Mengistu and Salami, 2007). The vegetation of Ekiti State University campus falls into forest eco-climate vegetation. The principal vegetation comprises of forest trees and shrub species which co-exist side by side. The herbs layer is dominated by grasses. The most frequently occurring grass species are *Sporobolus pariculatus, Cristida adscensisnis, Panicum maximum, and Imperata cylindrical.*

Bird Assessment

A survey of abundance and diversity of avifauna species of Ekiti State University and its three associated sites were carried out using point count method as described by (Fuller and Langslow, 1984). Point counts were carried out four hours per day, two hours each in the morning and late in the evening in each of the sites for three consecutive days in the month of May to July 2018. In the morning, the point counts were carried out from 7:00am-9:00am and in the evening from 16:30pm-18:30pm. Birds' counting at each of the three sites was based upon the outline procedure of Bibby et al*.,* (1998). The method of counting excludes those birds outside of the sampled sites; the counting was focused only in bird found in the site under investigation, excluding those from the surrounding area. A total of three counting stations were established in each of the three study sites. All of the count stations were view quietly with the assistance of three observers.

The observation and counting period allotted for each of the stations was 30 minutes within this period of time, all birds were counted and recorded as they were observed. Counting and recording were carried out with concerted effort not to miss any individual and not to include already recorded individuals. The individual birds were identified using the field guides to birds of Western African (Burrow and Demey, 2004) assisted by binoculars.

Study Site

The landscape of Ekiti State University was stratified into three habitats, which were the pristine, farming and human habitable areas. Between the month of May and July, 2018, data on bird species diversity, distribution and abundance were collected from three stratified areas of Ekiti State University landscape. The sites were widely far from each other in order to minimize the effect of Pseudo replication (Oksanen, 2001). Abbreviations are used to represent the selected sites;

L1 = Site located in the pristine area with least disturbance.

L2 = Site located close to the area where various form of farming practices takes place.

L3 = Site located at human habitable area which is under continuous stress anthropogenic influence.

Data Analysis

Data on bird species observed in the three locations of Ekiti State University (Pristine, Farming practices and Human habitable areas) were put together to determine the species composition, diversity and abundance of birds (Table 2). The data were subjected to analysis of variance (ANOVA) to determine the degree of homogeneity between Order, Families and Species composition of birds observed in the three studied locations. To compare the diversity of the bird species in the three investigated sites, the Shannon-Wienner diversity index (H') was applied (Shannon and Weaver, 1949). Similarity index and Species richness were calculated. Relative abundance of avian species is determined using encounter rate that gives crude ordinal scales of abundance (abundance, common, frequent, uncommon and rare) (Bibby et al., 1998). Encounter rate incorporates the field hours of observation and the number of individuals of each species observed. This allows an encounter rate to be calculated for each species by dividing the number of birds recorded by the number of hours spent searching, giving a figure of birds per hour for each species. The abundance categories were < 1.0, 1.1 – 2.0, 2.1 – 10.0, 10.1-40.0 and > 4.0. For each of category, the following abundance score is given; 1 (rare), 2 (uncommon), 3 (frequent), 4 (common) and 5 (abundance) respectively.

RESULTS

Species composition, abundance and diversity of birds in the anthropogenic disturbed area of Ekiti State University

The result of this study had shown that a total of one hundred and forty -four (144) individuals' birds of forty-three (43) species belonging to thirteen (13) orders and twenty-three (23) families were recorded across the three sampled areas of Ekiti State University (Table 1). The order Passeriformes constituted the predominant group with twenty-eight (28) families and twelve (12) species at 60% and 30% respectively. The families with the largest number of species were Bucerotidae (n=8). The bird species in the sampled areas were unequally distributed among the sampled areas. Twenty-one bird species belonging to 12 orders and 17 families were recorded in the human habitable sample plots, 20 species were observed in the farming practices area belonging to 8 orders and 15 families while the pristine sample areas with the least degree of disturbance recorded 20 bird species belonging to 10 orders and 13 families. In all the three study areas the most wide spread species was common bulbul (*Pynctous barbatus*) whose abundance ranked highest in the study areas (n=9) while splendid sunbird (*Cinnyris cupreas*) and trumpeter hornbills (*Bycanites bucinator)* were the next most widespread species with n=8 and n=7 in each of the sample area respectively. Some birds were exclusively limited to each of the sampled area, 11 (37.93%), 8 (27.59%) and 10 (34.48%) in the pristine, farming and human habitable areas respectively (Table 3).

The composition of birds observed in the sampled areas of the anthropogenic disturbed area of the university was not significantly different at ($P>0.05$). The highest species diversity and evenness was recorded in the human habitable area (Table 4). One hundred and forty-four individual birds were recorded in the study area with the highest number of sightings in the human habitable area (47) followed by farmland (40) while the pristine area also recorded (57) (Table 4). Moreover, the number of individual bird species observed in three sampled sites were significantly different at ($P<0.05$). Based on the Margalef species richness index (H), the farmland area with a value of 5.12 had the highest species richness followed by the habitable area (4.99) while the pristine area had the least value (4.66). The Shannon- Wiener indices were highest in the human habitable area (2.93) followed by that of farmland area (2.89) while the pristine area had the least value (2.63). With regard to species evenness the farmland area registered more even distribution of bird species followed by the human habitable area while the pristine area had the least. A further analysis of the relative abundance of bird species observed in the sample area of university anthropogenic disturbed area showed that 7, 4 and

Table 1. Observed Bird species composition in Ekiti State University**.**

S/N	Common Name	Scientific Name	Order	Family
1	Common bulbul	*Pycnotus barbatus*	Passeriformes	Pyncnonotidae
2	Wattle black hornbill	*Ceratogyma atrata*	Coraciiformes	Bucerotidae
3	Splendid sunbird	*Cinnyris coccinigastrus*	Passeriformes	Nectariniidae
4	Copper sunbird	*Cinnyris cupreus*	Passeriformes	Nectariniidae
5	Diederick cuckoo	*Chrysococcyx caprius*	Cuculiformes	Cuculidae
6	Black shoulder kite	*Elanus caeruleus*	Acciptriformes	Acciptridae
7	White crested hornbill	*Tropicranus albocrustatus*	Coraciiformes	Bucerotidae
8	Collared sunbird	*Hodydipna collaris*	Passeriformes	Nectariniidae
9	Laughing dove	*Streptopelia senegalensis*	Columbiformes	Columbidae
10	Great sparrow hawk	*Accipter melanoleucus*	Acciptriformes	Acciptridae
11	Heuglin francolin	*Pternistis icterorhynchus*	Galliformes	Phasianidae
12	Bronze manikin	*Spermestes cullullatus*	Passeriformes	Estrilididae
13	Village weave bird	*Ploleus cucullatus*	Passeriformes	Ploceidae
14	Black and white manikin	*Spemestes bicolor*	Passeriformes	Estrididae
15	Africa pied hornbill	*Lophoceros fasciatus*	Bucerotiformes	Bucerotidae
16	Pygmy king fisher	*Ispidina picta*	Coraciiformes	Alcedinidae
17	Common kestrel	*Falco trinnunculus*	Falconiformes	Falcondae
18	Spectacled weaver	*Ploceus ocularis*	Passeriformes	Ploceidae
19	Black breasted apalis	*Apalis flavida*	Passeriformes	Cistilolidae
20	Trumpeter hornbill	*Bycanistes bucinator*	Coraciiformes	Bucerotidae
21	White eared barbet	*Gymmobucco leucotis*	Piciforme	Lybiidae
22.	Black bee-eater	*Merops gularis*	Coraciformes	Meropidae
23.	Black shoulder kite	*Elanus caeruleus*	Accipitriformes	Accipitridae
24.	Grey cuckoo shrike	*Coracina caesia*	Passeriformes	Compephagidae
25.	Red eyed dove	*Streptopelia semitopyata*	Columbiformes	Columbidae
26.	Tawny flanked prinnia	*Priniasub flava*	Passeriformes	Cisticolidae
27.	Black-billed weaver	*Ploceus melanogaster*	Passeriformes	Ploceidae
28	Speckled tinker bird	*Pogoniulus scolopaceus*	Piciformes	Lybiidae
29.	Long tailed widow bird	*Euplectes progne*	Passeriformes	Ploceidae
30.	Spotted flank barbet	*Tricholaema cacrymosun*	Piciformes	Lybiidae
31.	Blue spotted wood dove	*Turtur afer*	Columbiformes	Columbidae
32.	Fischer lover bird	*Agapoinis fischeri*	Psittaciformes	Psittacidae
33.	Red fronted tinker bird	*Pogonilus leucomytes*	Piciformes	Lybiidae
34.	Compact weaver	*Ploceus pachyrhyclus*	Passeriformes	Ploceidae
35.	Cattle egret	*Ardeola ibis*	Ciconiiformes	Ardeidae
36.	Western grey plantain eater	*Crinifer piscator*	Musophagiformes	Musophagidae
37.	Pied crow	*Corvus capensis*	Passeriformes	Corvidae
38.	Red chested cuckoo	*Cuculus solitaries*	Cuculiformes	Cuculidae
39.	Speckled mouse bird	*Colius stratus*	Coliiformes	Collidae
40.	Black-collared lover birds	*Agaporniss winderniana*	Psittaciformes	Psittaculidae
41.	Dwarf raven	*Corvus splendid*	Passeriformes	Apodidae
42.	Little swift	*Apus affinis*	Apodiformes	Apodidae
43.	Golden pipit	*Tmetothy lacustenellus*	Passeriformes	Motacillidae

Table 2. Abundance of Bird species in the Study sites.

S/N	Common Name	L1	L2	L3
1	Common bulbul *Pycnotus barbatus*	3	1	5
2	Black casqued hornbill *Ceratogyma atrata*	4	0	2
3	Splendid sunbird *Cinnyris coccinigastrus*	4	0	4
4	Copper sunbird *Cinnyris cupreas*	1	0	0
5	Dideric cuckoo *Chrysococcyx caprius*	2	0	0
6	Black shouldered kite *Elanus caeruleus*	1	1	0
7	White crested hornbill *Tropicaranus albocristatus*	1	0	0
8	Collared sunbird *Hodydipna collaris*	2	1	4
9	Laughing dove *Stretopelia senegalensis*	3	0	0
10	Great sparrow hawk *Accipter melanoleucus*	2	0	0
11	Heuglin’s Francolin *Pternistis icterorhynchus*	1	0	0
12	Bronze manikin *Spermetes cucullatus*	4	0	2
13	Village Weaver Bird *Ploceus cucullatus*	1	0	2
14	Black and white manikin	4	0	0
15	African Pied Hornbill *Tockus fasciatus*	1	0	3
16	Common Kestrel *Falco trinnunculus*	1	0	0
17	Spectacled Weaver *Ploceus ocularis*	2	0	0
18	Black Breasted Apalis *Apalis flavida*	4	0	0
19	Trumpeter Hornbills *Bycanistes bucinator*	2	5	1
20	White eared barbet *Gynnobucco leucotis*	0	4	0
21	Black Bee eater *Merops gularis*	0	1	2
22	Red eye dove *Streptopelia semitorquata*	0	2	4
23	Pygmy kingfisher *Ispidina picta*	3	0	0

Table 2. Continue.

24	**Grey cuckoo shrike** ***Coracina caesia***	**0**	**2**	**0**
25	Tawny flanked prinnia *Prinnia subflava*	0	2	5
26	Blacked billed weaver *Ploceus melanogaster*	0	1	0
27	Speckled tinker bird *Pogoniulus scolopaceus*	0	2	0
28	Green pigeon Treron australis	0	1	0
29	Yellow –billed Barbet *Trachyphonus purpuratus*	0	4	0
30	Blue spotted wood dove *Turtur afer*	0	2	1
31	Western grey plantain eater *Crinifer piscator*	0	1	0
32	Fischer love bird *Agapornis fischeri*	0	1	0
33	Red fronted tinker bird *Pogonicilus leucomytes*	0	1	0
34	Compact weaver *Ploceus pachyrhychus*	0	2	0
35	Cattle egret *Ardeola ibis*	0	3	2
36	Pied crow *Corvus capensis*	0	3	1
37	Red-chested cuckoo *Cuculus solitaire*	0	0	1
38	African harrier hawk *Polyboroides typer*	0	0	1
39	Speckled mouse bird *Colius stratus*	0	0	3
40	Golden pipit *Tmetohy lucustenellus*	0	0	3
41	White crown shrike *Europtialus ruppelli*	0	0	1
42	Dwarf raven *Cornus capensis*	0	0	4
43	Shikra *Accipiter badius*	0	0	4

7 species were rare, 6, 7 and 8 were uncommon while 7, 9 and 6 bird species were frequent in the pristine, farming and human habitable areas respectively (Table 5). The Sorensen's similarity index values of comparing bird species between habitats ranked highest between the pristine and human settlement (29.27%) followed by pristine and farming area (20.00%) while the lowest value

Table 3. Order, Family, Species composition and Exclusive bird species composition in the study sites.

Location	Order	Family	Species	Exclusive Bird Species
L1	9	13	20	11
L2	8	15	20	8
L3	12	17	21	10

Table 4. Diversity, Evenness and Species richness indexes of Birds in the sites study.

Location Diversity indices	L1	L2	L3
No of bird species	**20^{a}**	**20^{a}**	**21^{a}**
No of individual birds	**47^{a}**	**40^{b}**	**57^{c}**
Shannon-Weiner index (H')	**2.87**	**2.89**	**2.93**
Evenness	**0.88**	**0.85**	**0.89**
Margalef species richness	**4.47**	**5.12**	**4.49**

Table 5. Number of Bird Species Composition in different Relative Abundance Category in the study sites.

Relative Abundance	L1	L2	L3
Rare	7	4	7
Uncommon	6	7	8
Frequent	7	9	6

Table 6. Similarity indices of the Bird community structure of the study sites of Ekiti State University.

Compared Station	Sorenson's Quotient
L1 and L2	20.00
L1 and L3	29.27
L2 and L3	19.51

(19.51%) was obtained between the farming and human habitable areas (Table 6).

DISCUSSION

Habitat floristic and physiognomy transformation are significant factors that erode species diversity in any area. Hence bird species diversity is often used to make quick assessment and comparison of different habitats (Pablo et al., 2006). Very little is known about the effects of anthropogenic disturbances on the diversity and distribution of bird species of Ekiti State University (Ogunyemi and Orimaye 2015). The simple analysis presented from the results of this study supports the evidence that tropical native bird species may be moderately affected by habitat disturbance. Consistent with previous studies our results showed that the common effects of disturbance include increased species richness due to increase in the presence of forest edge species, but a reduction in the relative abundance of certain species or groups of species (Lambert, 1992; Johns, 1996). The bird species composition reported in the three locations of the anthropogenic disturbance of Ekiti State University were not significantly different, while the birds' abundance showed pronounced significant differences. The varying levels of disturbance in the university environment had no pronounced effects on the distribution of birds in the area in view of which the human habitable area of the study recorded highest species abundance and diversity. These results negate the generally acknowledged patterns in literature that bird species abundance and diversity differ between the less disturbed and more disturbed vegetation types (Girma et al., 2011). The differences in bird species abundance and diversity in the three locations of study may therefore reflect this difference. Maximum number of bird species abundance and diversity was recorded in the human habitable area of Ekiti State University which may be due to the low threshold of anthropogenic pressure in the area. The variation in bird species composition and abundance among the locations of study may be due to the intensities of disturbance which would bring about the variation in food, cover availability, micro-climate variation and predation pressure. Takele and Afework (2018) and Rajpar and Zakaria (2015) had observed that the distribution of animal is largely dependent on the availability of food, water and cover. The farming location of the study which was near agricultural fields was observed to experience less disturbance but had the least number of individual birds which could be due to non-availability of mature crops during the study period. Crops field can provide important bird habitat from perspectives of food quality and quantity (Reinecke et al*.,* 1989; Huttink and Sibenmorgen, 1996) as they provide natural food like plant seeds and green forage (Manley et al*.,* 2004).

CONCLUSION

Ekiti State University has high ornithological and overall biodiversity values and deserves conservation attention. This study provides information on the effects of anthropogenic disturbance on the diversity and distribution of birds in the university community. The outcome of present study revealed that the human habitable area of the university equally and reasonably support bird life alongside with the less disturbed pristine and farming locations of the university. Bird species composition is valuable indicator of environmental qualities. The occurrence of fair diversity and impressive number of individual bird species in the study locations indicate that the university environment is still within tolerable ecological threshold. Therefore, it is very important to develop an effective measure to maintain the ecological qualities.

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